

REMARKS

Claims 1, 17 and 21 are amended; new claim 76 is added; claims 22-75 are cancelled; and claims 1-21 and 76 are pending in the application. New claim 76 is supported by the originally-filed application at, for example, paragraph 0072, and therefore does not comprise "new matter".

The pending claims stand rejected as being unpatentable over Palmer, either alone, or in combination with Imori or Magerlein.

Applicant has amended claim 1, and believes that the amended claim is allowable over the cited references. As amended, claim 1 recites a method in which a semiconductor component having a first side and opposing second side is provided. An opening is formed to extend entirely through the component, and accordingly to extend from the first side to the opposing second side. A first material is deposited along sidewalls of the opening at a temperature of less than or equal to 200°C. A solder-wetting material is plated within the opening and over the first material. Solder is formed within the opening and along the solder-wetting material to fill the opening, and therefore to extend from a first elevational level of the first side of the component to a second elevational level of the opposing second side of the component.

The amendments to claim 1 are supported by, for example, Fig. 12 where a solder-wetting material 224 is shown to only partially fill an opening, and where solder 240 is shown to fill the opening and extend from an elevational level of a first side 113 of a semiconductor component 110 to an elevational level of a second side 111 of the

semiconductor component. As the amendments to claim 1 are supported by the originally-filed application, such amendments do not comprise "new matter".

Amended claim 1 is believed allowable over the cited references for at least the reason that the references do not suggest or disclose the claim 1 recited plating of a solder-wetting material within an opening that extends entirely through a semiconductor component, followed by filling the opening with solder so that the solder also extends entirely through the component.

The cited reference of Palmer discloses formation of an opening entirely through a semiconductor component, but shows the opening filled with a second conductive layer 26 (see, for example, Fig. 1) that Palmer indicates is "typically formed by an electro-chemical deposition technique or any other suitable low-temperature process." Palmer goes on to state that the material 26 would comprise copper, gold or any other suitable conductive material. Accordingly, the materials specifically disclosed in Palmer as being utilized to fill the opening are not solder, but rather are electro-chemically deposited materials such as copper and gold. However, at paragraph 0031 Palmer indicates that the layer 26 can be other materials besides those specifically disclosed, which may lead to the argument that it would be reasonable to utilize solder for the layer 26 of Palmer. However, even assuming that there is a reasonable inference in Palmer that solder can be utilized for layer 26, Palmer is not disclosing or suggesting the claim 1 recited combination of a solder-wetting material formed to partially fill the opening with a solder that entirely fills the opening.

Applicants' specification indicates at, for example, paragraph 0012, that a problem exists in the art in uniformly filling holes with solder. The specification goes on to explain

that efforts have been made to provide solder-wetting agents within holes in order to draw solder into the holes, but that the prior art efforts utilized high-temperature processing which could adversely impact circuitry associated with semiconductor components. The specification goes on to state in paragraph 0034 that aspects of the present invention include low temperature deposition of a metal nitride film within an opening, followed by plating of the film with solder-wetting material. The specification then states at paragraph 0035 that solder can be drawn into the opening along the solder-wetting material. Additionally, the specification indicates at paragraph 0072 that exemplary methodology of the invention can enable formation of a solder-wetting material (such as, for example, nickel) at an operating temperature of from about 59°C to about 64°C. Such low temperature formation of the solder-wetting material can avoid the problems that existed in the prior art. Thus, the specification indicates that the recited invention of amended claim 1 (i.e., the utilization of a solder-wetting material in combination with a solder to fill the recited opening) can provide significant advantages over prior art methods of filling such openings.

The significant advantage which can be achieved with the claim 1 recited process relative to prior art processes evidences the patentability of claim 1. Palmer's general discussion that any material can be formed within openings as the layer 26 does not suggest or disclose the claim 1 recited procedure of deposition of a first material within an opening at a temperature of less than 200°C, followed by formation of a solder-wetting material over the first material, which in turn is followed by formation of solder within the opening to entirely fill the opening.

The Examiner's other cited references of Magerlein and Imori also do not suggest or disclose the claim 1 recited invention in which a first material is deposited along sidewalls of an opening at a temperature of less than or equal to about 200°C, followed by formation of a solder-wetting material along the first material, followed by formation of solder within the opening to entirely fill the opening. The reference of Magerlein shows solder formed along a solder-wetting material (specifically, nickel), but shows the solder formed within a relatively shallow opening, and does not suggest or disclose that the solder is formed within an opening that extends entirely from one side of a component to another side of the component. Further, the reference of Magerlein does not suggest or disclose the recited features of claim 1 in which a first material is deposited along sidewalls of an opening at a temperature of less than or equal to about 200°C, followed by plating of a solder-wetting material within the opening and over the first material. Also, nothing amongst the references suggests utilization of the solder-wetting material and solder of Magerlein to fill openings of the type described in Palmer.

For the above-discussed reasons, the cited references do not, either alone or in any combination, suggest or disclose the subject matter of amended claim 1 in which an opening is formed to extend entirely through a component, a first material is deposited along sidewalls of the opening at a temperature of less than or equal to about 200°C, a solder-wetting material is plated onto the first material, and solder is formed within the opening and along the solder-wetting material to entirely fill the opening. Amended claim 1 is therefore allowable over the cited references, and applicant respectfully requests such allowance in the Examiner's next action.

Claims 2-21 and new claim 76 depend from claim 1, and are therefore allowable for at least the reasons discussed above regarding claim 1. Applicant therefore requests that the Examiner's next action be a Notice of Allowance, formally allowing claims 1-21 and 76.

Respectfully submitted,

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